



National Aeronautics and Space Administration

Lyndon B. Johnson Space Center  
Houston, Texas



## Underwater exploring

As part of the JASON Project, area students explore the Florida Keys without getting wet. Story on Page 3.



## Inspecting debris

A team of employees in Space and Life Sciences study space debris impacts on Mir equipment. Photo on Page 4.

# Space News Roundup

Vol. 35

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No. 18



NASA Photo

The STS-77 astronauts take time out at the slidewire baskets on the emergency egress system during the Terminal Countdown Demonstration Test at Kennedy Space Center. From left are, Mission Specialist Dan Bursch, Commander John Casper, Pilot Curt Brown and Mission Specialists Mario Runco, Andy Thomas and Marc Garneau. Endeavour is scheduled to liftoff from Launch Pad 39B May 19.

## Managers clear Endeavour for May 19 launch

By James Hartsfield

Following a flight readiness review Tuesday, shuttle managers cleared the way for a 5:30 a.m. CDT May 19 liftoff of Endeavour on STS-77.

Work on Endeavour at KSC has continued to go smoothly, and the STS-77 launch countdown is now scheduled to begin at 3 a.m. CDT Thursday. The crew of STS-77 — Commander John Casper, Pilot Curt Brown and Mission Specialists Andy Thomas, Dan Bursch, Mario Runco and Marc Garneau — will arrive in Florida at 8 a.m. CDT Thursday to prepare for the launch.

Working with two experimental satellites, STS-77 will feature more rendezvous and station-keeping activities than ever performed on a single shuttle flight. The first major event on the flight will be the deploy of the Spartan-207 satellite carrying the Inflatable Antenna Experiment on the second day of the mission. Following deploy, Casper will keep Endeavour in close proximity to the Spartan for more than four hours while the antenna experiment is inflated and equipment in the cargo bay is used for investigations. After the antenna science package is jettisoned, Endeavour will return to Spartan the next day to retrieve it and place it back in the cargo bay for the return to Earth.

On Day 4 of the flight, the next satellite, called the Satellite Target

Unit, will be deployed. The STU is used as a target for investigations with the Passive Aerodynamically Stabilized Magnetically Damped Satellite experiment, or PAMS, which will characterize a new method for stabilizing satellites in orbit. To conduct the experiment, Endeavour will station-keep with the satellite following its deployment and then return to within a half-mile of the STU on two separate occasions later in the mission.

Also aboard Endeavour will be the Spacehab module, making its fourth shuttle flight and carrying more than one and a half tons of secondary experiment equipment. In addition, other secondary experiments to be mounted in Endeavour's cargo bay and in the crew cabin will include investigations ranging from biological studies to space technology development.

An on-time launch of Endeavour May 19 would lead to a planned landing of STS-77 in Florida at 6:07 a.m. CDT on May 29.

Work this week on Endeavour at Launch Pad 39B included close-outs of the engine compartment and the installation and checkouts of space suits that would be needed in a contingency.

Meanwhile, work continues to ready Columbia for a mid-June launch. Please see COLUMBIA, Page 4



## Priroda work begins today

Mir 21 Cosmonaut Researcher Shannon Lucid begins science activities in the Priroda module of the Russian Mir Space Station today after a week of preparing Priroda and stowing supplies that arrived on a Progress vehicle.

"We have been real busy here," Lucid said during a status briefing Wednesday. "Priroda got here with a lot of scientific equipment we will be working with in the next month. And like moving into a new house, you can't get to work instantly. You have to unpack and repack and get everything situated."

"We worked a lot on Priroda and got to a point where we couldn't do much because we had packing material we had to do something with before we could really get



down to work. Progress got here and brought up more supplies and as soon as we get Progress unloaded, we will load up all the packing material from Priroda into Progress. Progress will then be sent back down to Earth and we will be able to get down to the scientific work in Priroda."

The Progress resupply vehicle attached to a Soyuz rocket was launched from the Baikonur Cosmodrome in Kazakhstan on Sunday and successfully docked with the Russian outpost Tuesday. The Progress brought Lucid and her crewmates—Commander Yuri Onufrienko and

Flight Engineer Yuri Usachev—food, clothes, fuel and other supplies to Mir. The docking of the supply vehicle Please see LUCID, Page 4

## GANE to gain knowledge, fine tune space station orbit

One of the more important aspects of the International Space Station is keeping the orbiting outpost in a safe low-Earth orbit.

Nestled in Endeavour's cargo bay aboard the PAMS-STU Hitchhiker carrier during STS-77 will be an experiment to help determine how the International Space Station will accomplish the task of staying in orbit.

The station will use the Global Positioning System, or GPS, for not only position, veloc-

ity and time information, but attitude determination as well. The experiment, proposed in 1994, is designed to find out whether GPS attitude can be measured to 0.1 degrees or less per axis of rotation. The Global Positioning System Attitude and Navigation Experiment, or GANE, experiment will be used to fine-tune the use of GPS on the International Space Station. GANE will fly off-the-shelf equipment and

station-supplied equipment to determine the accuracy with which GPS-derived attitude data can be measured in space.

"We formed a team in August of 1994," said Penny Saunders-Roberts of the Avionics Systems Division and project manager of GANE. "The team worked hard to develop an experiment that met all space station requirements in such a short time."

The team developed an experiment that

consists of two independent systems: a GPS receiver/processor and antenna assembly, and an inertial reference unit. Both of these systems will be mounted on a GPS antenna mounting structure attached to the top of the Hitchhiker carrier. The GPS R/P and the IRU will each independently use a crew cabin-located Payload and General Support Computer for command and data storage.

Please see GANE, Page 4

## JSC helps develop solar refrigerator

Oceanering Space Systems to collaborate on project

Space-age refrigeration that may cool future astronauts on the moon or space station may someday provide environmentally friendly alternatives for Earth's inhabitants.

JSC and Oceanering Space Systems signed a Space Act Agreement last week for the development of a solar refrigerator. Under the cooperative research agreement, OSS will provide an advanced prototype refrigerator based on space station technology and JSC will provide a solar array and test the integrated system. Three innovative coolers, or "heat pumps," will be tested over the next year: thermoelectric, Stirling and vapor compression.

NASA is conducting this "dual-use technology" project as part of its investigation of solar heat pumps for missions such as a lunar base. Heat pumps will be used to refrigerate food in a lunar base and to "air-condition" living spaces for astronauts.

"As advances are made in these

aerospace heat pumps, we will be able to apply what we learn to improve refrigerators and air-conditioners on Earth" said Mike Ewert, principal investigator on the project. The most immediate application of solar refrigerators will be in remote areas where there is no electric grid.

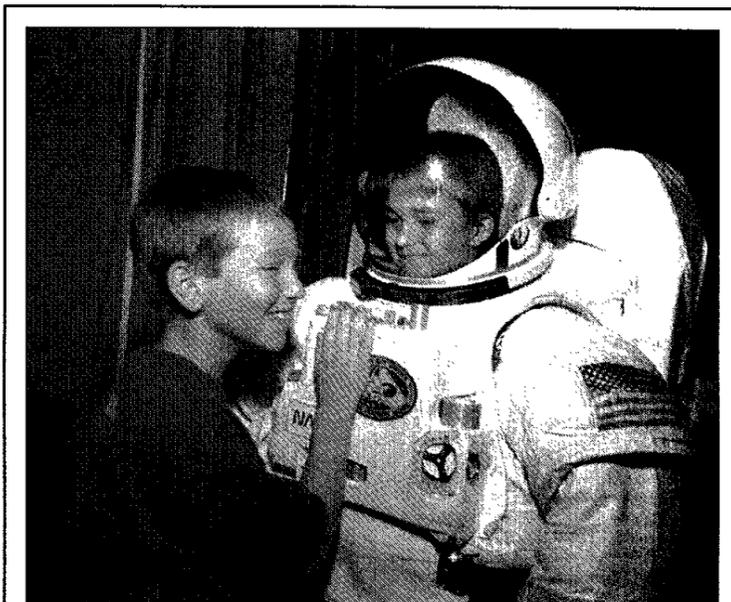
The three heat pumps that will be tested, as well as the space age refrigerator cabinet and solar power supply, offer environmental benefits on Earth. The thermoelectric modules are solid state, semi-conductor devices which produce cooling from a DC power source with no moving parts or harmful refrigerants. The Stirling heat pump, which uses helium gas, is a mechanical device which produces cooling when driven by a linear motor. The vapor compression heat pump, similar to those in most refrigerators today, will still use a Freon refrigerant, but it will be the newer type which does not contain chlorofluorocarbons that are

believed to harm the ozone layer.

The refrigerator cabinet in which the three heat pumps will be tested incorporates a vacuum superinsulation that limits refrigerator heat gain. The superinsulation currently used is made of evacuated stainless steel panels. The vacuum insulation reduces power consumption, saves energy and makes it more feasible to power with solar photovoltaic panels, which are still fairly expensive.

The solar photovoltaic panels are semi-conductor devices which convert sunlight directly to electricity. Developed for the space program, PV is now finding many uses on earth powering such things as calculators and cellular phone equipment in remote locations. PV panels made of silicone will be used for power.

The solar refrigerator also will "store cold" in phase change materials which release heat when they solidify and absorb heat when they liquefy, the way ice does.



JSC Photo by Nick Nelms

TAKE OUR CHILDREN TO WORK—Cody McNeil, daughter of Valerie McNeil of ILC Dover, helps Bryce Sauser, son of Bruce Sauser of the Crew and Thermal System Division, try on a space suit in a Bldg. 7 lab. Children spent a day at work with their parents last month as part of "Take Our Children To Work Day."

JSC

# Ticket Window

The following discount tickets are available for purchase in the Bldg. 11 Exchange Store from 10 a.m.-2 p.m. Monday-Thursday and 9 a.m.-3 p.m. Friday. For more information, call x35350 or x30990.

**Home tour:** Galveston Historic Home Tour May 4-5 and May 11-12. Tickets cost \$13.50.

**Astroworld:** One day pass cost \$17.25.

**Fiesta Texas:** One day pass cost \$17.25.

**Six Flags:** One day pass cost \$17.25.

**Sea World:** Adult tickets cost \$24.50, Children (3-11) cost \$17.25.

**Space Center Houston:** Discount tickets, adult, \$8.75; child (3-11), \$7.10.

**Movie discounts:** General Cinema, \$4.75; AMC Theater, \$4.50; Sony Loew's Theater, \$4.75.

**Stamps:** Book of 20, \$6.40.

**JSC history:** *Suddenly, Tomorrow Came: A History of the Johnson Space Center.* Cost is \$11.

**Metro tickets:** Passes, books and single tickets available.

**Upcoming events:** Caribbean Getaway Sept. 13-20. Cost is \$359. Deposit of \$200 due July 8. Mexico Cooper Canyon Trip Nov. 6-12. Cost is \$995. Deposit of \$200 due Sept. 6.

JSC

# Gilruth Center News

**Sign up policy:** All classes and athletic activities are first come, first served. Sign up in person at the Gilruth Center and show a NASA badge or yellow EAA dependent badge. Classes tend to fill up two weeks in advance. Payment must be made in full, in exact change or by check, at the time of registration. No registration will be taken by telephone. For more information, call x30304.

**EAA badges:** Dependents and spouses may apply for photo identification badges from 7 a.m.-9 p.m. Monday-Friday; and 8 a.m.-4 p.m. Saturdays. Dependents must be between 16 and 23 years old.

**Fitness Challenge:** 1996 Fitness Challenge runs to Aug. 31. Employees are eligible to win \$100 gift certificates. For more information call Larry Wier at x30301.

**Defensive driving:** One day course is offered once a month. Cost is \$25. Interested employees should call the Gilruth.

**Stamp club:** Meets at 7 p.m. every 2nd and 4th Monday in Rm. 216.

**Women's self defense:** Martial Arts training for women only from 5-6 p.m. Tuesdays and Wednesdays. Cost is \$25 a month.

**Weight safety:** Required course for employees wishing to use the weight room is offered from 8-9:30 p.m. May 23. Pre-registration is required. Cost is \$5.

**Exercise:** Low-impact class meets from 5:15-6:15 p.m. Mondays and Wednesdays.

**Aikido:** Martial arts class meets from 6:15-7:15 p.m. Tuesday and Wednesday. Cost is \$25 per month. New classes begin first of each month.

**Aerobics:** Class meets from 5:15-6:15 p.m. Monday, Tuesday and Thursday. Cost is \$32 for eight weeks.

**Ballroom dancing:** Cost is \$60 per couple. For additional information call the Gilruth Center at x33345.

**Country and Western dancing:** Beginner class meets 7-8:30 p.m. Monday. Advance class meets 8:30-10 p.m. Monday. Cost is \$20 per couple.

**Fitness program:** Health Related Fitness Program includes a medical examination screening and a 12-week individually prescribed exercise program. For more information, call Larry Wier at x30301.

JSC

# Swap Shop

Property

Lease: LC, 2-1, appli, W/D, fans, spa, all bills pd, \$550 mo + dep. avail after 5/15. Bill, 332-3649.

Sale: LC, Bayridge, 3-2-2, cul-de-sac, new roof, \$55k make offer. James, 286-1934.

Sale: Nassau Bay townhome, 3-2.5-2, gorgeous home, spacious, bright, clean, \$105k. 335-7216.

Sale: Camino South, 4-2-2, formals, fenced, new AC/H, stove top, water heater. 282-3479 or 532-1112.

Sale: University Trace condo, 1 + study, new carpet/paint, appliances. 333-3925.

Lease: Condo, 2-1.5-2, balcony unit, freshly painted, some new appli, W/D conn, fans, \$525/mo + dep. L. Das, x33235 or 488-5532.

Sale: Lake Livingston, Harmon Creek, 3 waterfront lots, approx 230' waterfront, 1 acre, city water, elect/septic sys installed, \$24k. x33750 or 470-9569.

Lease: Middlebrook, 4-2-2, both formals, den, FPL, fans, good cond, \$900 mo. 486-8551.

Sale: Condo, 1 BDR, W/D, FPL, sec alarm, appli, cov'd parking, new carpet, tennis, upstairs. Jim Briley, 244-4632 or 488-7901.

Sale: 130 cleared acres, 5 pastures, near Tyler, house, hay/horse barns, divid, all ameni. 488-5058.

Sale: Webster condo, 2-2-2CP, upstairs flat w/new A/C, upgrade in kitchen/bathroom, wbfpl, full sz W/D conn, \$37.5k. Pat, 488-2290.

Rent: Dickinson, garage/workshops, 15'x20', \$100 or 15'x30', \$115 mo. Larry, x33168 or Carol, 393-2820.

Sale: Brook Forest, 4-2-2, 2300 sq ft, FPL, new carpet/paint/tile/fence/ AC/H, \$129k neg. Brian, x32635 or 480-4351.

Rent: Bay Glen, 3-2.5-2, huge yard, w/shaded deck, close to parks/pools/school, \$1.1k mo + dep. Tom, x33651 or 280-8084.

Sale/Lease: Condo, 1-1 + study w/french doors, covered patio & carport, fans, nice view. x47486.

Rent: Arkansas cottage overlooking Blue Mt Lake & Mt Magazine, furn, stone FPL, wooded, \$50/day or \$250/weekly. Corcoran, x47806 or 334-7531.

Rent: South Lake Tahoe cabin, 3-2, sleeps 8, cable TV/VCR, kitchen, W/D. x41065 or 326-2866.

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'95 Mazda Protege, white, tilt/cruise, A/C, pwr W/L, remote lock, FM/AM/cass. Beverly, 471-0644 or 790-9545.

'86 Toyota 4x4 xtra cab, 4 cyl, auto/OD, A/C, bed liner, shell over bed, 125k mi, good cond, \$5.5 obo. x36440 or 326-2664.

'84 Mazda RX-7 GSL-SE, black/red, sunroof, 5 spd, AM/FM/cass, good cond, \$2,950. 318-0412.

'91 Nissan 300ZX twin turbo, black pearl w/dark grey leather int, CD, chromed wheels 33k mi, ex cond, \$22k. 286-7484.

'90 Nissan Stanza XE, pwr, A/C/H, new tires/auto trans, 81k mi, ex cond, \$5.5. Linda, 283-0311 or 409-925-4862.

'94 Ford Ranger, ext cab, white, 36k mi, 5 spd, sliding rear wind., A/C, P/B/P/S, \$10,250. 334-4470.

'85 Mercury Marquis LS, 2 dr, tan hardtop, 90k mi, ex cond. 488-5342.

'89 Dodge Ram Charger 150LE, sport utility, 2WD, A/C, pwr D/L & W, AM/FM/cass, alarm, 318 V8, AT/OD, towing pkg, good cond, \$5.6k. John Gardner, x45684 or 527-4195.

'92 Honda Prelude, 48k mi, new tires, ex cond, \$12.5k. 286-2128.

'86 S10 Chevy truck, new shocks/tires/clutch, rebuilt engine, \$1.5k obo. 332-8444.

'86 Honda Prelude Si, red/black, sunroof, auto, alarm good cond, \$3k. Lisa, x40213 or 554-4140.

'70 VW Karmann Ghia conv, 57k mi, runs great, needs some body work, \$2,995. 997-6868.

'64 Ford Galaxie, 289 eng, 4 dr sedan, auto, P/S, A/C, driven daily, \$1950 obo. 280-9740.

'87 Nissan Sentra, red, AM/FM/cass, 2 dr, 5 spd, A/C, looks & runs great, best cash offer. 280-9740.

'91 Isuzu PU, 5 spd, 72k mi, A/C, alarm, cruise, CD, bed cover, mags, tint, \$4.8k. 992-0782.

'91 Firebird, red, T-tops, loaded, ex cond, \$8,995. 409-938-3491 or 337-1311.

'94 Firebird, 6 cyl, 5 spd, AM/FM/CD, alarm, green, 29k mi, tinted, dual airbags, ABS braking sys, ex cond, \$11k obo. 280-2246 or 534-6750.

'82 RV, Dolphin on Toyota, 21', 68k mi, \$3.5k obo. 244-8252 or 361-2703.

'86 S10 Chevy truck, new shocks/tires/clutch, rebuilt engine, \$1.5k obo. 332-8444.

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Audio Visual &amp; Computers

Mac Performa, 635 CD, 8MB RAM, 250MB HD, Mac Color monitor, kybd, mouse, MS Office 4.2, \$800; Mac Powerbook 145b - 8MB RAM, 80MB HD, 2 batteries, ex cond, \$825. Bobby, x42444 or 488-4382.

486 DX2-66, 8MB mini-twr, 14' SVGA, \$695; Compaq 386, 4MB 14' VGA, \$395; Pentium 75-100-133-166, 8MB/635, Win 3.11 or 95+ Office & other SW, \$939/\$1029/\$1169/\$1459. Don, 333-1751.

Pentium 75MHz, 8MB RAM, 1.2 GB HD, 3.5 FD, 4X CD Multi Media kit, 14.4 fax/modem, 14' monitor, 1MB video, Win '95, \$1.5k obo. Christen, 280-8149.

Cellular mobile phone, w/carrying case, ex cond, \$40. 480-8101 x560.

Smith Corona personal word processor w/Corona-CALC; extras, warranty, \$295. 602-4005.

Yamaha stereo system w/double door cabinet, \$375 obo. 996-0152.

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NMA class: The Texas Gulf

Coast Council of the National Management Association will host a 10-hour "Financial Strategies for Successful Retirement" seminar from 6-9 p.m. May 15, 22 and 29



# Undersea Adventure

## Students examine underwater treasures without getting wet

**F**or two weeks at JSC, more than 5,000 students explored the reefs and marine life of Florida as part of the JASON Project.

This year's mission, "Voyage VII: Adapting to a Changing Sea," was downlinked from scientists in Florida to students around the country, including those in JSC's Teague Auditorium. Using computers at JSC, students joined JASON scientists and "drove" underwater vehicles as they explored marine life off the Florida Keys.

Participants at several interactive sites joined Dr. Robert Ballard, a scientist from the Woods Hole Oceanographic Institution and founder of the JASON Project, in a submarine on an exploration of several interconnected water habitats—the Everglades, Florida Bay, the Florida Keys and relic reefs.

The research team's role was to study the marine habitats and the stresses placed upon them by human activities, and to make suggestions and predictions for the future. Student investigations included aquatic field investigation, designing visual shark targets, shark tracking research, coral rings and climate change, patchwork quilt exercise and exploring a steel reef.

Three scientific expedition objectives were completed during the two-week expedition. One was an investigation of the natural cycles that will help determine life cycles and adaptation of organisms, climatic change, water flow, nutrient flow and geologic events.

Working with Dr. Jerry Wellington of the University of Houston, JASON Project students mounted an investigation of climate change using the coral reefs. Corals, like trees, produce growth rings. The girth of each ring indicates the amount of growth in a year, providing researchers a history of climate change. The researchers will use the historical record to determine whether human activities affect those changes for the reefs, which provide habitats and food for the aquatic organisms in that area.

"I was one of the controllers," said Henry Orosco from Seabrook Intermediate. "You're actually learning about some place most people can't go and survive. You learn interesting things about things you didn't know like tiny organisms and bacteria."

Students also were asked to help

identify parts of a human-made steel reef. Scientists believe that the steel reef is a barge called the Vitric that capsized and sank on March 29, 1944, while carrying molasses from New Jersey to Florida.

"We were doing this project during this semester," said Brandy Smith from Elrod Elementary in Houston. "Our teacher brought up this story and we got excited with it and we started making these little submarines where you blow air into this straw to power them."

Students also designed targets to attract sharks in the Florida waters. They first researched sharks and their sensory systems and planned designs based on the sharks' ability to distinguish different shapes, colors and degrees of brightness. Next, they developed shark plots to look for patterns in their activities.

Students also monitored crocodile nesting and hatching success.

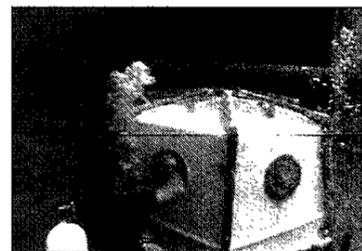
Other investigations included the study of corals, fish, and shelf science. Students interacted with sci-

entists in the only operational undersea habitat—the National Undersea Research Programs' *Aquarius* laboratory—deployed at Conch Reef off Key Largo, Fla. *Aquarius* provides scientists with capabilities in a comfortable living environment underwater. A crew of six averages stays of seven days at an operating depth of 55-120 feet.

The goal of the JASON Project is to engage and excite students in science and technology. Prior to participating in the JASON Project, local teachers attended a training course held at JSC. Teachers were given a JASON curriculum guide with suggested lesson plans designed to complement expedition activities and to increase student awareness and interest in science.

The JASON Foundation for Education is supported by public, private and non-profit organizations including the EDS Corporation, Bechtel Group Inc., the National Geographic Society, the United States Department of Education and NASA.

"I was controlling all the questions and the video," said Scott Pensyl, from Seabrook Intermediate. "It was really a lot of fun. I've come here for three years now. Next year's project should be a lot different. I've dealt with the volcanoes, two underwater projects, and now it's going to be Iceland. So it's going to be really different and exciting." □

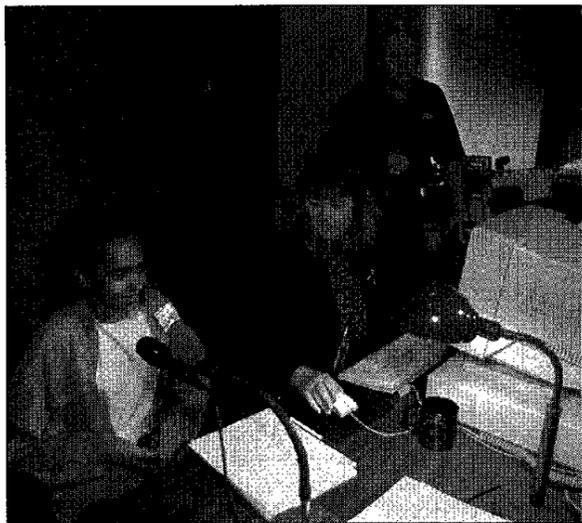
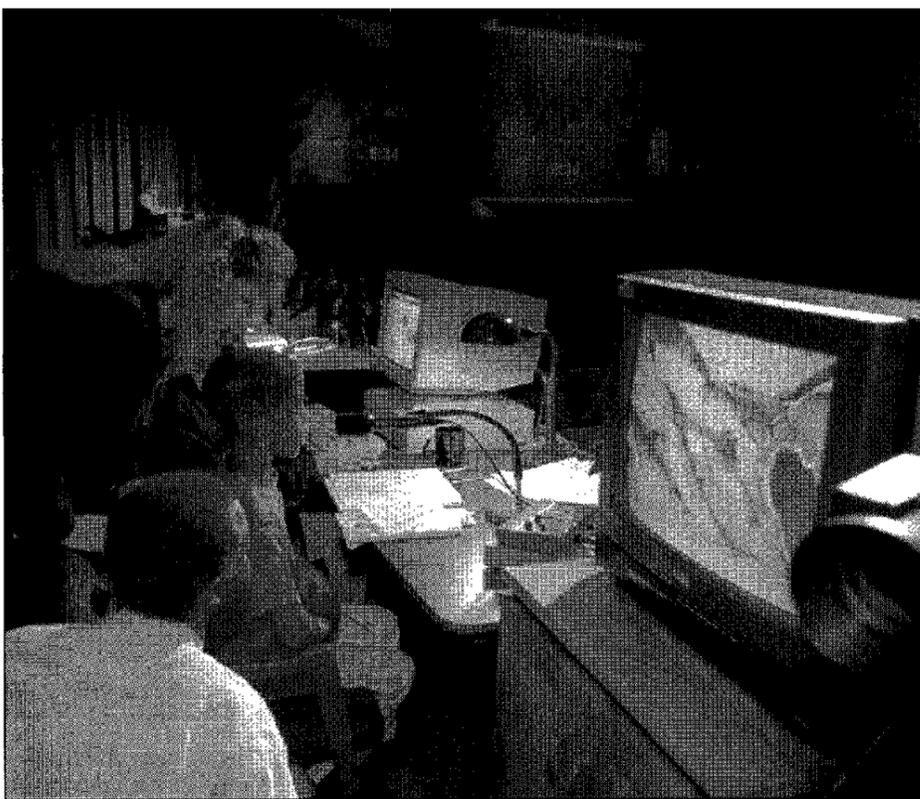


*'You're actually learning about some place most people can't go and survive. You learn interesting things about things you didn't know like tiny organisms and bacteria.'*

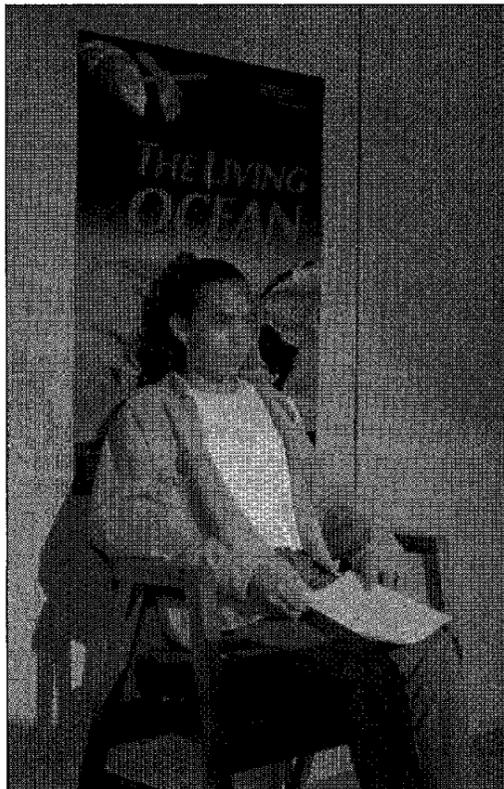
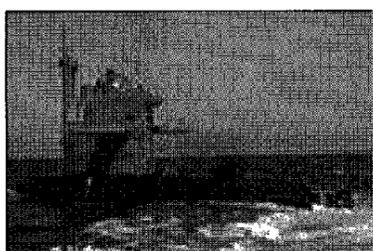
—Henry Orosco  
Seabrook Intermediate



**JASON  
PROJECT**



JSC Photos by  
Mark Sowa



Top to bottom, left to right:

- 1) Lori Wheaton of JSC's Education Team helps Joseph Zerwas, left, and Anna Brewer of Calvary Episcopal School in Richmond, Texas, work on one of the computers tracking the JASON Project.
- 2) Travis Jackson of Hartsfield Elementary School records his question with the help of Wheaton and JSC Teacher Resource Center coordinator Leroy Jackson as JASON activities are shown on the large screens of Teague Auditorium.
- 3) Divers clean the windows on the *Aquarius* undersea laboratory.
- 4) Trilce Marquez records her question as Wheaton and teammate Gordon Eskridge, both of Oklahoma State University, look on.
- 5) Marquez, of Challenger Elementary, Pearland, has her image captured.
- 6) The submarine Nuclear Research-1 supports the JASON Project off the Florida Keys.

# JSC prepares for Savings Bond campaign kicks off

JSC is ready to kick off its annual U.S. Savings Bond Campaign on Wednesday.

"I'm pleased to announce the beginning of the 1996 U.S. Savings Bond Campaign at JSC and encourage your participation in this worthwhile effort," said JSC Director George Abbey. "The purchase of savings bonds is important both to the well-being of the nation's economy and to the personal savings programs of individuals."

Campaign coordinator Teresa Sullivan said the purchase of savings bonds is a transaction where both the buyer and seller profit.

Interest rates are market based and are adjusted every six months, climbing as market rates increase. The current short-term rate—for bonds held five years—is 4.75 percent which purchasers begin earning immediately. The long-term rate applies to bonds held longer than five years through original maturity at 17 years. The present long-term rate is 5.16 percent.

The program provides numerous other

advantages, she said. Interest earned, for example, is not subject to state or local taxes, and federal tax liability can be deferred until the bonds are cashed. In addition, when bonds are redeemed for the purpose of financing higher education interest earned under some circumstances is tax free.

"The purchase of U.S. Savings Bonds is an investment in tomorrow," Abbey said.

Take  
Stock  
in America



## Juneteenth picnic set at Gilruth

The JSC Black Cultural Association will host its "Annual Juneteenth Scholarship Picnic" from 11 a.m.-8 p.m., June 21, 1996, at the Gilruth Center.

This event is a joint venture between the BCA and the Black United Fund of Texas and will feature a softball tournament between BCA and BUF-TX. In addition, the Ron McNair Scholarship Award will be presented.

Adult tickets cost \$10, and children under 12 years cost \$5. Ticket price includes a barbecue dinner, dessert, drinks and entertainment. Music will be provided by a disc jockey at picnic goes also will have the opportunity to test their skills at card games and dominos.

Tickets are now on sale until June 12. For ticket information, call Judith Elam at x34441.

## Travel Fair reminder

The Employee Activities Association is sponsoring a Travel Fair from 4-6:30 p.m. Tuesday at the Gilruth Center.

Tickets for door prizes are available at the Bldg 11 Exchange Store. For more information, call x35352.



JSC Photo By Benny Benavides

**ENVIRONMENTAL INSPECTION**—Lockheed Scientist Jack Warren surveys the meteoroid and space debris impact in a thermal blanket from the Russian Mir Space Station. The blanket covered an experiment monitoring cosmic rays, and is now performing double duty as a sensor of the particulate environment in low-Earth orbit. Studies in the Facility for Optical Inspection of Large Surfaces, in Bldg. 31, are revealing the extent of hazards posed to spacecraft and suited astronauts by particles which travel at velocities in excess of 7 km per second.

## Volunteers needed for American Heritage Week

This year, JSC will expand American Heritage Day by celebrating cultural diversity the week of June 10-14 and the American Heritage Week committee is looking for additional volunteers to make the event memorable.

This year's theme, "A Patchwork of Cultures and Diversity," will be highlighted daily with entertainment, exhibits and displays in the Bldg. 3 cafeteria. The grand finale of the week's activities will be at 3 p.m. June 14, with a variety of performers and food vendors representing many ethnic cultures.

"American Heritage Week will spotlight cultures and diversity that are present in the JSC workplace," said Estella Hernandez Gillette, director of the Equal Opportunity Program Office. "This celebration is an effort to create a greater appreciation for our cultural diversity yet demonstrate that these diversities add strength to the JSC team."

In order to accomplish such an event, volunteers are needed for a variety of tasks. Volunteers are needed to serve on the planning subcommittees, as well as to participate in the activities including food pick-up from local eateries, food servers, "town criers" to help announce and publicize daily events, greeters and clean-up. Employees interested in helping in any of these areas, can call Bridget Broussard-Guidry at x34834.

In addition, employee exhibits and displays are needed. These exhibits/displays are to depict employees' cultural diversity of hobbies, creations, collections and other interests. The following categories will be highlighted during the week—art work (painting, sculpting, modeling); needlework (quilting, embroidering, dress making); collections (antiques, collectibles, items of interest); hobbies (crafting, creating, woodworking); and vintage autos (restored, in restoration, original condition). Interested exhibitors need to contact Elaine Kemp at x30556. Both JSC civil servants and contractor employees are welcome to participate. General questions can be answered by calling x30601.

# JSC selects fellowship, institute science participants

Two JSC employees have been selected to participate in JSC's Fellowship Program and one employee will attend the International Space University in Austria this summer.

This year's Fellowship Program participants are James Masciarelli of the Engineering Technology Office, who will attend the University of Houston working towards a master science degree in mechanical engineering, and Tim Straube of the Navigation Control and Aeronautics Division, who will attend the University of Colorado and work toward a doctorate in aerospace engineering sciences.

The JSC Fellowship Program provides for a select number of employees the opportunity to attend graduate school on leave with pay basis for one continuous year. The criteria for this competitive program includes applicability of the chosen area of study and its effectiveness in contributing to the achievement of JSC's mission and goals, a brief statement of academic purpose from the applicant, academic record of the applicant, written recommendation from the division chief and activity level in the employee's office and the employee's own work load.

Cuong Nguyen of the Shuttle Safety and Mission Assurance Division was selected to attend the International Space University in Vienna, Austria, this summer.

Nguyen will attend the 10-week program hosted by the Austrian Society for Aerospace Medicine. The program is a multidisciplinary, multinational space education and research program. Its curriculum will include systems architecture and mission design; business and management; engineering; life sciences; policy and law; resources, robotics, and manufacturing; and satellite applications.

JSC sponsorship includes payment of program fees and room and board through the Human Resources Development Branch, and round-trip travel expenses and miscellaneous per diem through the employee's directorate.

Nguyen was nominated and selected based on his career level, high potential to assume future leadership roles, outstanding record of professional contributions, proven ability to work well in teams and deal effectively with a wide range of people and his knowledge of a foreign language.

## Lucid, crew mates busy preparing Priroda for Earth observations

(Continued from page 4)

was a first with the new Mir configuration and the crew reported everything went smoothly.

In readying the Priroda module for science activities, Lucid, Onufrienko and Usachev first removed 168 automotive-sized batteries. These batteries were used to provide Priroda with electricity while en route to Mir. The batteries were wrapped in plastic bags and transferred to the Progress resupply vehicle.

The Priroda battery wrapping activity was scheduled to take six days but the crew accomplished it in less than two days. The crew also connected Priroda to the Mir's power system and has been troubleshooting a Priroda power system problem detected during rendezvous.

As part of her Earth observations work, Lucid took photographs of the fires burning out of control in Mongolia. Lucid, a veteran of four previous space flights, reported that

she had never before seen such large fires from space.

The Ambient Diffusion Controlled Protein Crystal Growth experiment and the Protein Crystal Growth investigations are proceeding nominally. The crew activated the Space Acceleration Measurement System in support of the PCG Dewar experiment on April 26 for 48 hours. SAMS measures the slightest Mir movements. This data collection opportunity captured both the Priroda dock-

ing and repositioning. The information will assist scientists in correlating any changes noticed in their experiment data postflight.

At the cosmonaut training center in Star City, astronaut John Blaha received training on the active dosimetry experiment that he will be performing on his mission. Blaha will arrive on Mir in August to take over U.S. science work from Lucid. Astronauts Jerry Linenger and Mike Foale are in Germany, where they joined

the Mir 23 crew for training in preparation for the upcoming German-Mir '96 mission.

Astronaut Jim Voss participated in language and physical training before leaving for Houston and two weeks of vacation.

Mir 21 Cosmonauts Onufrienko and Usachev today marked their 79th day in space and 77th day aboard Mir since being launched aboard a Soyuz rocket February 21. Lucid has been on Mir for 48 days.

## Columbia moves to VAB next week

(Continued from page 4)

launch on STS-78, the Life and Microgravity Sciences mission. Currently in KSC's Bay 2 processing hangar, the Spacelab transfer tunnel was installed in the cargo bay this week, and the payload bay doors are scheduled to be closed for the final time on May 17. *Columbia* is planned to be moved to the Vehicle Assembly Bldg. for mating with the STS-78 solid rockets and fuel tank on May 23.

Elsewhere, *Atlantis* is in KSC's Bay 1 hangar being readied for a late summer launch on STS-79, the fourth Mir-shuttle docking mission.

## Space News Roundup

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Editor ..... Kelly Humphries  
Managing Editor ..... Karen Schmidt

## GANE to test critical space station component

(Continued from page 4)

"STS-77 Mission Specialists Mario Runco and Andy Thomas will operate the experiment," said Saunders-Roberts. "When GANE returns to Earth, then the data gathered during the flight will be analyzed."

The ISS program has determined that GPS attitude measurement is the number one risk mitigation experiment during the Phase I program. The GANE experiment will measure GPS receiver/processor and antenna assembly attitude determination, navigation and overall performance. In particular, the capability of potential candidate hardware and software will be evaluated.

GPS is a Department of Defense system that allows world-wide navigation. GPS is becoming the world standard navigation system that allows position determination within 100 meters or less. Pilots, boaters, hikers, and just about anyone can use GPS for accurate real-time position and velocity determination.

One unique aspect of GPS is its capability for determining the attitude of a vehicle using three or four antennas by measuring the GPS carrier phase through each antenna. This technique has been successfully tested on surface vehicles and aircraft, but it has not been tested in space before. GANE will accomplish

its experiment objectives by operating the GPS system through four on-orbit test sequences. Prior to and after the four data collection sessions, the orbiter will perform star alignment maneuvers to align the Inertial Reference Unit to the orbiter's Inertial Measurement Unit.

GANE is one of four experiments that will be carried aboard the PAMS-STU spacecraft. The package is called the Technology Experiments for Advancing Mission in Space, or TEAMS. The experiments are being flown together at reduced cost, with the Hitchhiker carrier providing electrical power, signals, and "downlink" data interfaces.